“Reverse” sexual dichromatism in golden rocket frogs

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Photo by James Tumulty

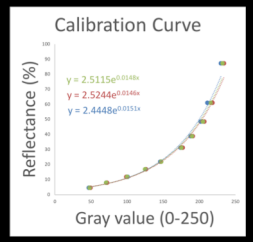
Background

Sexual dichromatism, a phenomenon where males and females have different coloration (with the male often being the more “showy” sex), is thought to largely be the result of sexual selection [1]. Another hypothesis for sexual dichromatism is sexual niche partitioning, which can occur when males and females use different resources or experience different predation pressures [2].

Golden rocket frogs are a diurnal species native to Kaieteur National Park in Guyana, and live and breed entirely in the giant tank bromeliads (Brocchinia micrantha), which have bright green leaves. These frogs show pronounced intraspecific variation in coloration and pattern [3].

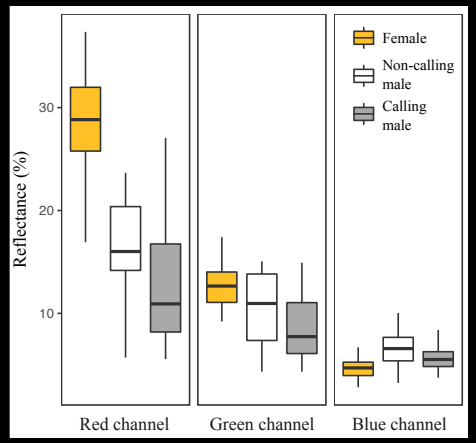
Photo by Johana Goyes Vallejos

Methods

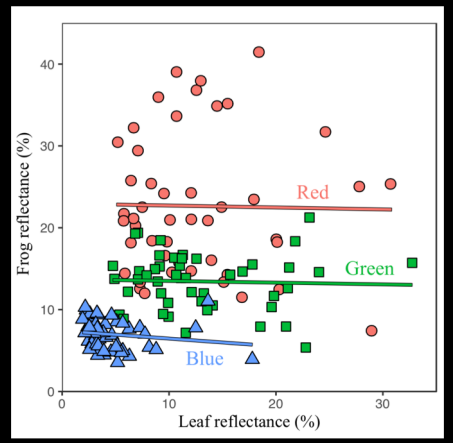


RGB values for each gray standard was plotted against the percent reflectance values from the spectrometer in each color channel to create a grey scale calibration curve for each channel in every photograph [4]. The curve was used to convert RGB values from the frog to the true percentage reflectance values for the body colors. 232 photographs, 34 males and 21 females were measured in total.

Results



Females are significantly brighter than non-calling males, and non-calling males are significantly brighter than calling males.



There is no significant correlation between frog color and leaf color.

Conclusions

Females were more brightly colored than males, indicating “reverse” sexual dichromatism. Golden color in females appears to develop at sexual maturity because juveniles are not golden.

Males turned darker when they were calling, which could accompany calls as an advertisement signal to females or an aggressive signal to other males.

There was no relationship between frog color and leaf color indicating that color variation in golden rocket frogs does not serve as camouflage to different habitats.

Reverse sexual dichromatism likely serves a social function. Possibilities include (1) a sex recognition signal signal which could minimize mistaken aggression from territorial males, (2) an intra-sexual dominance signal to other females, or (3) an indicator of female quality or condition to males if there is mutual mate choice in this system.

Significance

Examples of “reverse” sexual dichromatism are rare, but challenge the general assumption that males are the more “showy” sex and females are drab and “coy”.

[1] Darwin C. 1871 *The Descent of Man, and Selection in Relation to Sex.* London. [2] Heinsohn R, Legge S, Endler JA. 2005 Extreme Reversed Sexual Dichromatism in a Bird Without Sex Role Reversal. *Science (80-.).* **309**, 617–619. [3] Bourne GR. 2001 Color pattern, predator avoidance, and foraging behavior in the golden frog *Colostethus beebei* (Anura: Dendrobatidae). *Herpetol. Rev.* **32**, 225–228. [4] Johnsen S. 2016 How to measure color using spectrometers and calibrated photographs. *J. Exp. Biol.* **219**, 772–778.

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